October 18, 2019

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W:
Washington, D.C. 20554

Re: Expanding Flexible Use of the 3.7 to 4.2 GHz Band
GN Docket No. 18-122
Written *Ex Parte* Presentation

Dear Ms. Dortch,

Pursuant to Section 1.1206(b)(2) of the Commission's Rules and on behalf of PSSI Global Services, L.L.C. ("PSSI"), I am submitting a written *ex parte* presentation that reports on the results of and conclusions drawn from tests conducted by PSSI. The tests were intended to ascertain the impact of 5G mobile interference on the operation of fixed and mobile satellite earth stations.

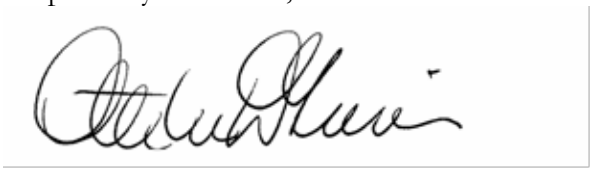
The attached report confirms that although filtering solutions being developed by the C-Band Alliance ("CBA") have shown great promise for protecting C-Band fixed satellite earth stations, there is still no solution as to how a transportable earth station like those operated by PSSI can avoid operating near high power 5G mobile nodes, and incurring signal degradation, distortion, multi-path interference and harmful out-of-band emissions from 5G terrestrial mobile operations operating on C-Band frequencies. Further, the report recommends submitting 5G operations using the C-Band to frequency coordination, as C-Band license holders are currently required to perform and incorporating such requirements – with appropriate Commission oversight and enforcement of technical violations – in the Commission's order in this docket.

The attached report follows up on a meeting held at the offices of the Commission on September 5, 2019 with Julius Knapp, Ira Keltz, Barbara Pavon, Bahman Badipour and Michael Ha of the Office of Engineering & Technology; Jim Schlichting of the International Bureau; Patrick DeGraba of the Office of Economics and Analytics; and Kenneth Baker, Tom Derenge and Paul Powell of the Wireless Telecommunications Bureau regarding the PSSI's concerns prompted by the proposed changes to the C-band. During that meeting, Robert C. Lamb, Manager and CEO of PSSI, said that he would provide the Commission with the results and conclusions of the tests that PSSI had conducted with the assistance of CBA, during the period August 26-28, 2019. As noted below, PSSI is providing copies of the report to all the participants in that meeting.

Pursuant to Section 1.1206(b)(2) of the Commission's Rules, an electronic copy of this letter is being filed in the above-referenced docket, with copies to the Commission officials who attended the September 5th meeting.

Please direct any questions regarding this filing to me at stephen.diaz.gavin@rimonlaw.com or at 202-871-3772.

Respectfully submitted,



Stephen Díaz Gavin

cc: Julius Knapp
Patrick DeGraba
Kenneth Baker
Tom Derenge
Jim Schlichting
Ira Keltz
Barbara Pavon
Bahman Badipour
Michael Ha
Paul Powell

Report on Impact of 5G interference on C-Band Fixed and Mobile Earth Stations

1. I am the Manager and CEO of PSSI Global Services, L.L.C. ("PSSI"). PSSI is the leading full-service satellite transmission company in the United States. PSSI and its clients work extensively with the C-Band frequencies (3.7-4.2 GHz) for live event transmission, distribution and programming insert reception. This report is intended to supplement the presentation that PSSI made to the Commission's Office of Engineering and Technology, the International Bureau, the Office of Economic Analysis and the Wireless Telecommunications Bureau on September 5, 2019, where I advised the Commission that we had conducted this study but not yet reached our conclusions regarding the tests.

2. From August 28 to 30, 2019, PSSI conducted tests and measurements at PSSI's facilities in Orlando, Florida to determine the anticipated impact of 5G interference on earth station antenna performance. We conducted the tests in cooperation and conjunction with engineers and technical personnel from the C-Band Alliance ("CBA"). Although the CBA had conducted laboratory measurements of this nature in April 2019 at its Atlanta facilities, PSSI endeavored to determine the impact of the 5G interference on both fixed and transportable earth stations located in a real-time environment, at various distances from a known 5G source.

Testing Procedures and Equipment

3. On the first day (August 28th) of the tests, calibration of our range and test equipment was conducted. As a result of initial tests run on the second day, PSSI established a baseline and proved repeatability. Finally, we conducted the tests and the results were compared to the baseline.

4. The following equipment was used in the tests:

Transmitter

- Rodhe Schwartz SMW-200 5G waveform generator (adjustable to +8dB output)
- 5G baseband filter (reduce out-of-band emission)
- Isolator (protect SMW)
- Power Amplifier: Mini circuit TVA-11(+39dB gain)
- 5G transmit antenna: GD satcom 1.2m quick deploy (+33dB gain)

Calibration

- Feedhorn antenna for calibration (20 dBi gain)

Receiver

- 4.5m earth station antenna: Trifold transportable
- Norsat 3115F PLL LNB (PSSI provided)
- Norsat 8215F DRO LNB (CBA provided)
- 5G reject filter (aka Filter G)
- Rodhe Schwartz FSW-8 spectrum analyzer
- Newtec MDM-6000 modem

Satellite location and transponders

- G3C @ 95 W transponder 11C, 6145MHz, V (uplink) and 3920 MHz, H (downlink)
- The uplink satellite signal was generated at the Atlanta Teleport using 3.8m antenna

5. I note that PSSI and CBA conducted this test with a directional parabolic antenna, although an actual 5G signal mobile telephone station will likely use an isotropic antenna. An isotropic antenna will illuminate much differently than a directional antenna. The energy will be more widely dispersed and much harder to shield, if shielding is even possible. In addition, since we will not know from which direction the 5G transmitter will be illuminating our antenna, we may not be able to provide any shielding that would be sufficiently strong to make a difference.

The Tests and Results

6. PSSI and CBA ran a series of tests where the output power levels of the 5G transmitter were

increased in 1dB increments to a final output power of +8dBm. This test series was used to determine the level at which the link margin would start to degrade due to the 5G interference. In this series of tests, the 4.5 meter transportable receive antenna was located 40 meters from the 5G transmitter. The transmitter included a 5G baseband filter. The transportable antenna did not have a 5G filter installed.

7. Once the output power of the waveform generator was raised to +8dBm, the combined power at the feed of the transmit antenna was 34.6dB or 2.884 Watts (33 dBm antenna gain plus 8dBm amplifier output minus 6.4dB cable loss). Under these test conditions, there was a 7dB degradation of signal when the transmitter reached +8dBm output. It had been expected that the signal would degrade when the transmitter reached certain output level. However, our major concern is that the proposed maximum power density (as supported by the CBA) can be as high as 62dBm/MHz (1640 Watts) in urban areas and up to 65dBm/MHz (3280 Watts) in rural areas. These power levels are far and above the 2 Watt power levels used in our testing where we noted a 7dB degradation of our satellite receive signal. We also learned that out-of-band interference exceeded threshold limits set forth in the Commission's Notice of Proposed Rulemaking at a point far below previously proposed 5G output levels (-128 dBm/MHz)[1].

8. In addition, we ascertained that transportable earth stations operating at locations not previously surveyed – something regularly encountered in the kinds of live events handled by transportable companies like PSSI -- will experience additional 5G interference and distortion properties due to multi-path interference. This finding is particularly important in the case of transportable earth stations because the proximity of buildings, trees, vehicles and other obstacles at locations from which live events are transmitted cannot be pre-determined. We attempted to shield the interference and were able to achieve a maximum of about 20dB of rejection, but this outcome was not

[1] *See Order and Notice of Proposed Rulemaking in Gen. Docket 18-122*, 33 FCC Rcd 6915, 6973 n. 301 (2018).

consistent over the full 5G spectrum. Therefore, the possibility of multi-path interference at any given location must be anticipated but cannot be predicted with any degree of certainty.

9. As expected from previous testing, the 5G filtering devices worked well to provide excellent in-band rejection at the fixed location antennae. However, as PSSI feared, engineering challenges to adapt 5G filtering to the smaller licensed C-band transportable antennae are a continuing problem. We remain hopeful that the antennae manufacturers will be able to address this concern and offer new or re-manufactured solutions in due order. However, unless this can be addressed, there will be serious concerns about any attempt at band rejection for transportable operators like PSSI.

10. Nevertheless, in the case of all transportable earth stations, we remain very concerned about operations near high-power 5G nodes at any location nationwide. Even if the proposed 5G filters offer 60dB of rejection, we are still concerned about receiving considerable interference due to the passive gain of the receive antenna and other factors.

11. An example of the problem in practice will be live transmission of sporting events from major athletic stadiums, which are now being retrofitted with numerous 5G nodes around the stadium premises. Provision of C-Band downlink reception service (for cross pol, program insertion, interactive data, communications, and monitoring) will require extensive coordination with all those 5G terrestrial mobile nodes and be subject to interference from them.

Conclusions

12. Ultimately, our August 2019 tests were only able to skim the surface as to what might happen in live field operations. There are many factors that can cause unpreventable signal distortion associated with 5G signals. If the mobile carriers and the transportable earth station community are to co-exist, we must determine how the activities of the 5G carriers can be managed and subjected to frequency coordination like the C-band uplink have been required to perform for decades, and are currently

conducting at every operating location.

13. Specifically, to determine the degree to which transportable earth stations will be affected by any 5G signal in any location of operation and still function properly, we would need to know the following:

- Exact location (latitude/longitude) of all 5G nodes
- Direction of the 5G beams in relation to an antenna location
- The individual output power levels at each of the 5G nodes

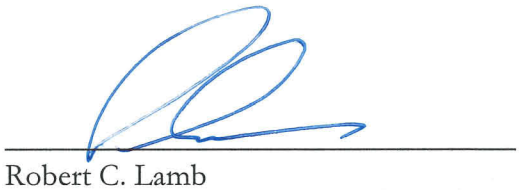
14. These are precisely the details that our transportable earth stations must presently provide in order to comply with the FCC's existing frequency coordination regulations and would be available to future 5G operators in the C-Band

15. To facilitate simultaneous operation by 5G terrestrial mobile carriers and continued satellite usage in the C-Band, the technical rules for mobile operators in the C-Band ultimately adopted by the Commission should require such frequency coordination by 5G mobile operators. ***Mobile operators should be required to submit the data noted above to the Commission's existing frequency coordination system to minimize the inevitable interference to the C-Band users who will continue to operate in the band***. Violation of the frequency coordination procedures should be considered a violation of the FCC Rules, with appropriate sanctions.

16. Nonetheless, based upon the results of the Orlando tests, PSSI continues to be concerned about C-Band mobile interference from future 5G terrestrial mobile operations in the C-band. There is presently no solution to how a transportable earth station can avoid the concern of having to operate within close proximity to high-power, 5G mobile telephone nodes, utilizing isotropic antennae, and being subject to multi-path interference and out-of-band emissions from 5G terrestrial mobile operations and other sources.

17. The technical rules ultimately adopted to permit mobile telephone operations in the C-Band must address these issues.

Dated: October 17, 2019



Robert C. Lamb